Electronic Supplementary Material (ESI) for Nanoscale Advances.


# Supplementary section

## Nano-manganese oxide and reduced graphene oxide doped polyacrylonitrile fiber mats as electrode material for capacitive deionization (CDI) technology

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**Figure S.1**

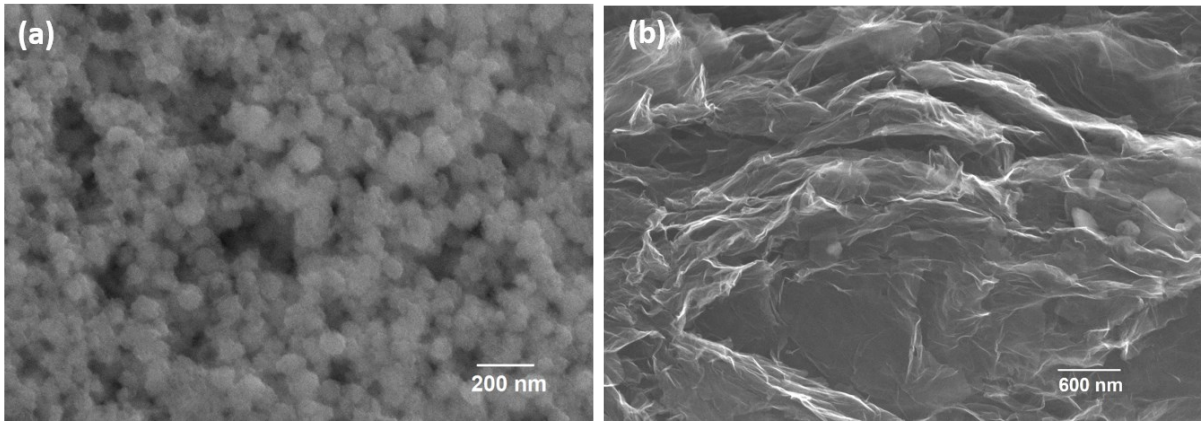


Figure S.1. Scanning electron microscopic images of (a) $MnO_2$ nanoparticles (b) rGO

**Figure S.2**

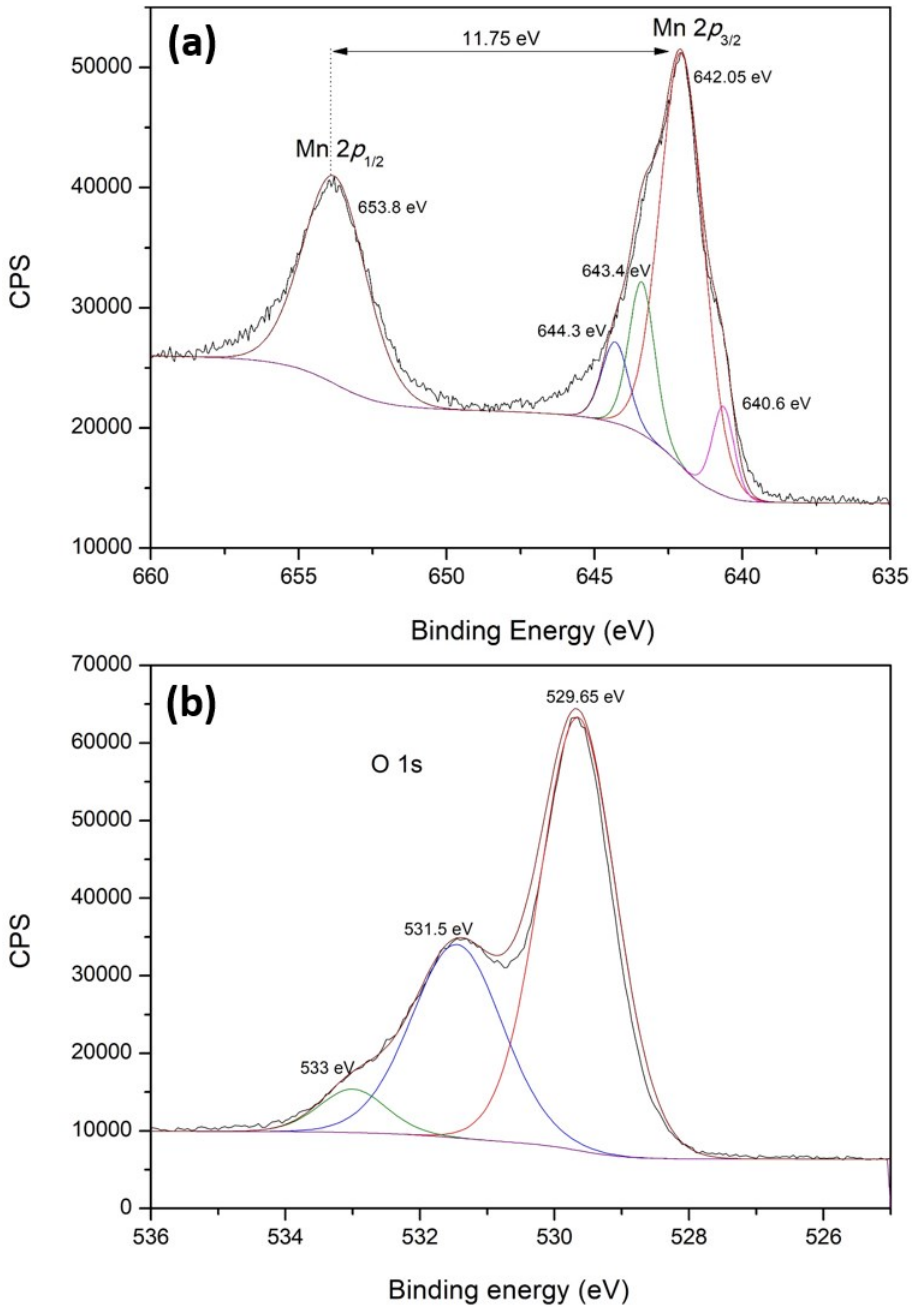


Figure S.2. (a) Mn 2p (b) O 1s X-ray photoelectron spectra of synthesized manganese oxide nanoparticles

**Figure S.3**

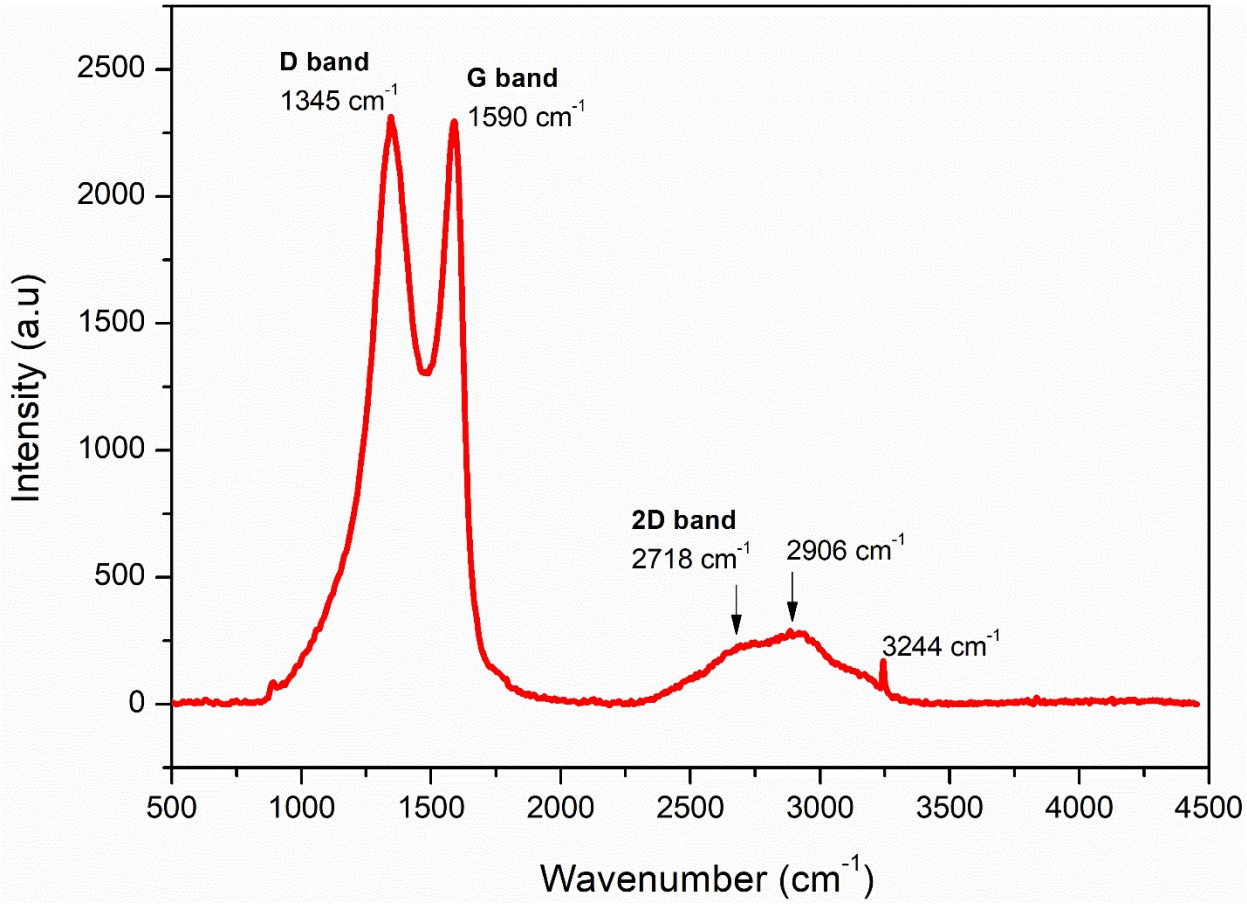


Figure S.3. Raman spectrum of rGO at 27 °C

**Figure S.4**

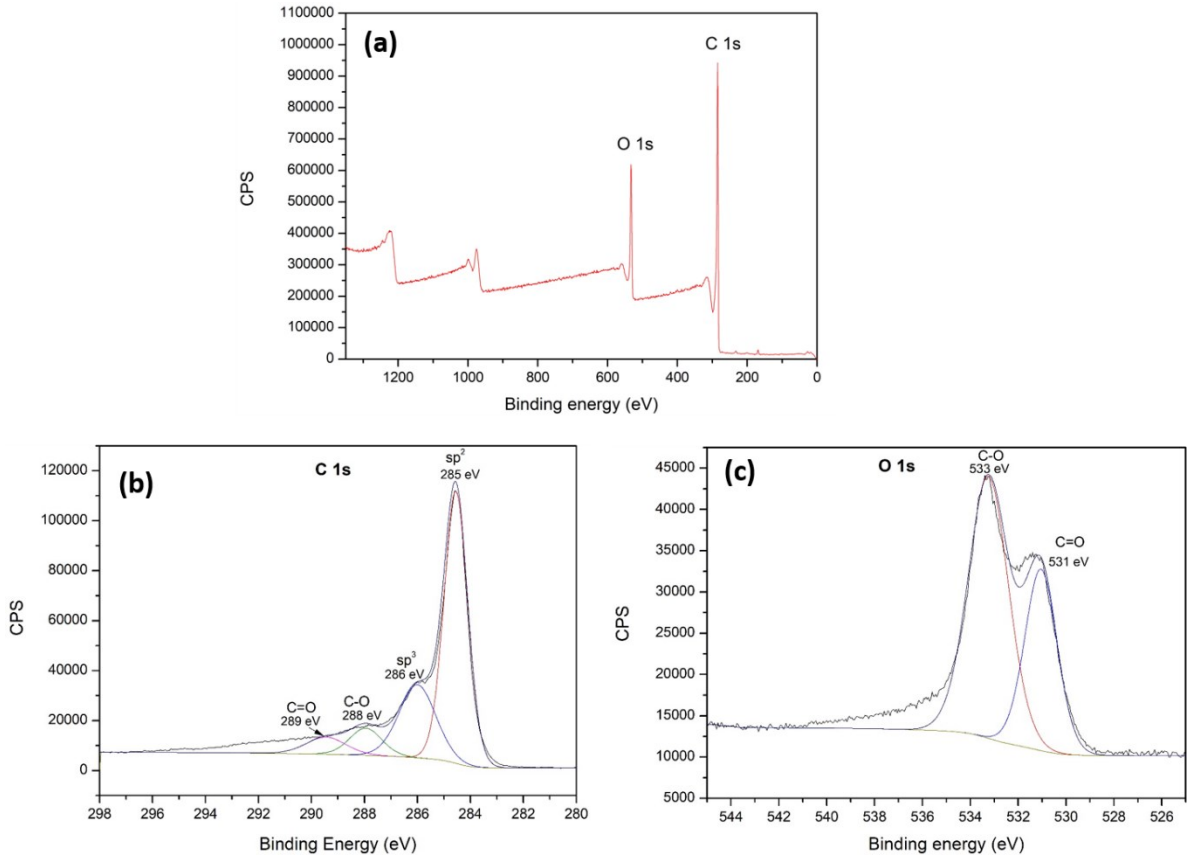


Figure S.4. X-ray photoelectron spectra of rGO (a) survey scan (b) C 1s and (c) O 1s

Table S.1 Elemental composition of rGO

| | Peak Binding energy | Atomic % | Total elemental % |
|---|---|---|---|
| C 1s | 285 | 49.12 | 84.82 |
| C 1s | 286 | 21.55 | |
| C 1s | 288 | 8.75 | |
| C 1s | 289 | 5.4 | |
| O 1s | 531 | 6.55 | 15.18 |
| O 1s | 533 | 8.63 | |

**Figure S.5**

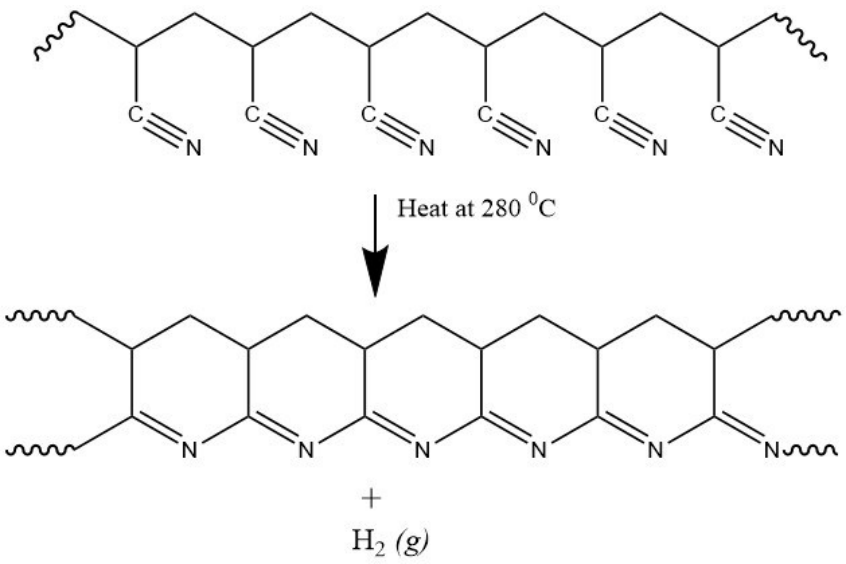


Figure S.5. Thermal stabilization of PAN fibers at 280 °C - Formation of cyclic structures

**Figure S.6**

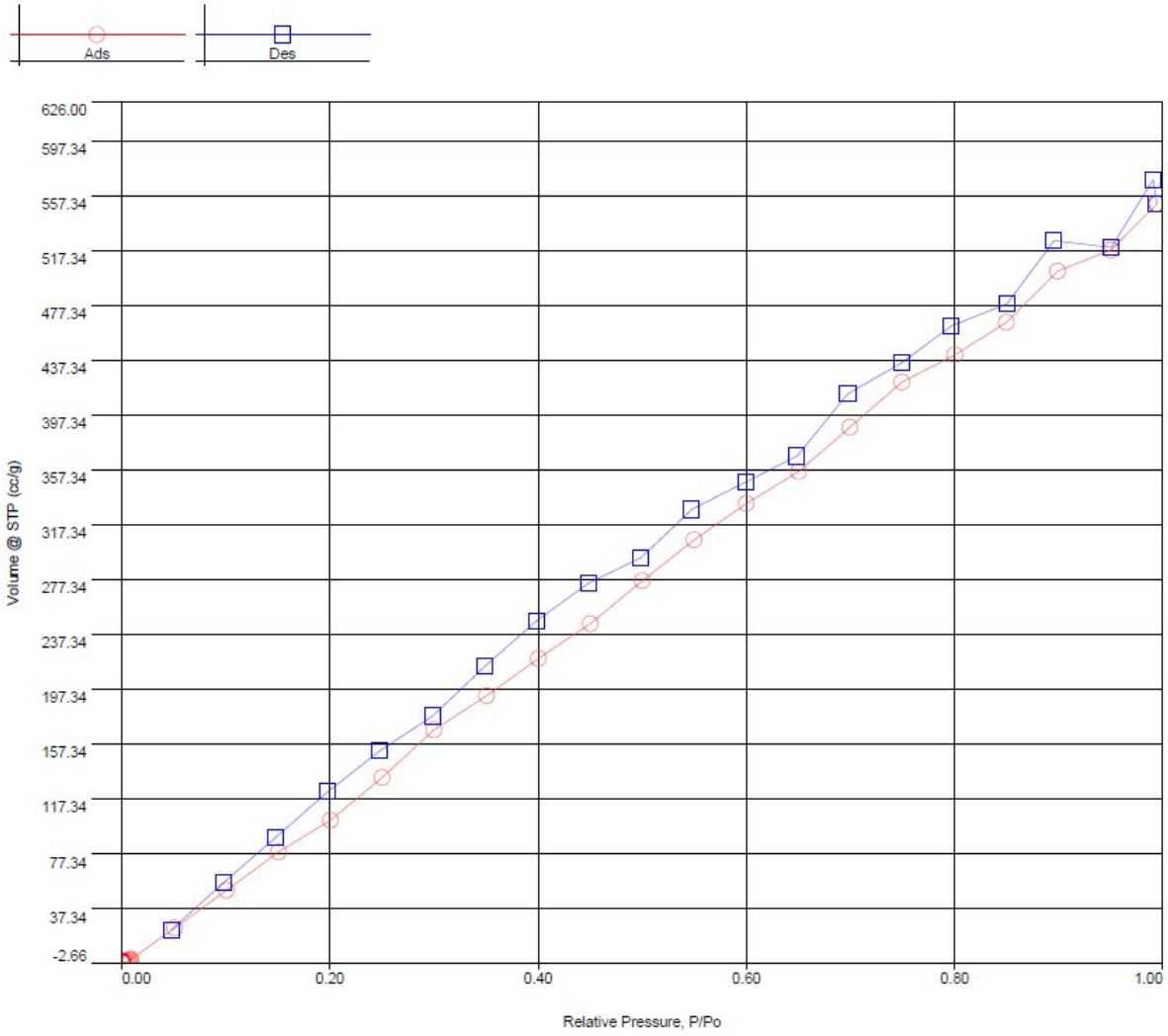


Figure S.6. BET adsorption/ desorption isotherm of C-rGOMnPAN electrode material

**Figure S.7**

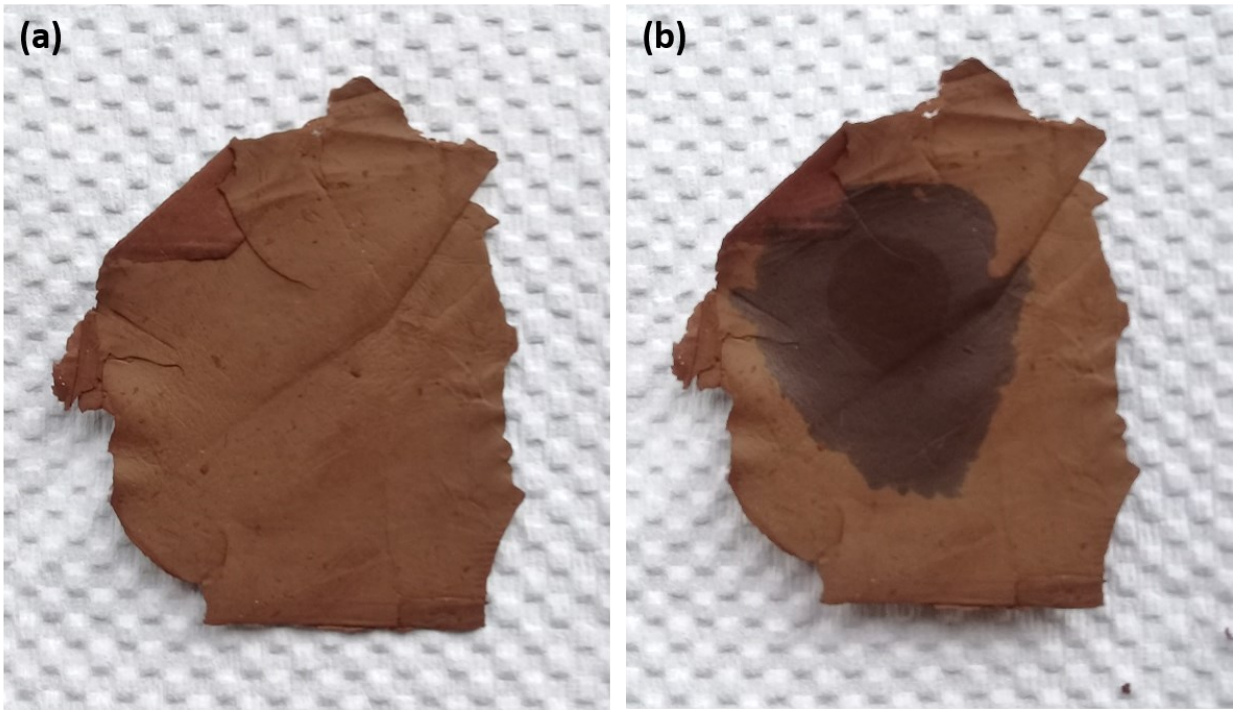


Figure S.7 C-rGOMnPAN membrane (a) before (b) after absorbing 50 µL of distilled water

Table S.2. Water adsorption by C-rGOMnPAN

| Thickness of the mat (mm) | Water quantity (µL) | Time required for complete absorption (seconds) |
|---|---|---|
| 0.05 ± 0.01 | 50.0 | 3 |
| 0.15 ± 0.02 | 50.0 | 7 |
| 0.10 ± 0.01 | 100.0 | 18 |

**Figure S.8**

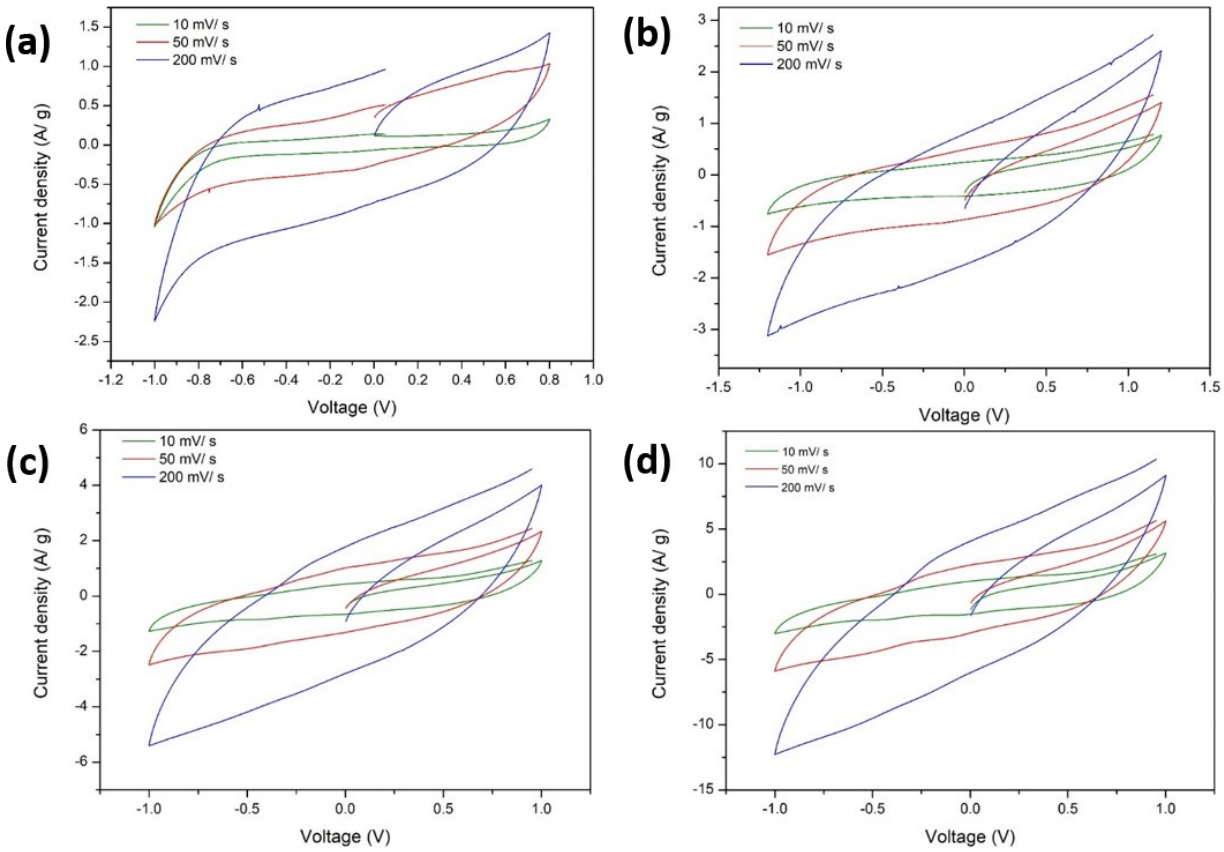


Figure S.8. Cyclic voltammograms of (a) 0%-MnPAN (pure PAN) (b) 17%-MnPAN (c) 33%-MnPAN and (d) 50%-MnPAN at 10, 50 and 200 mV/s

**Figure S.9**

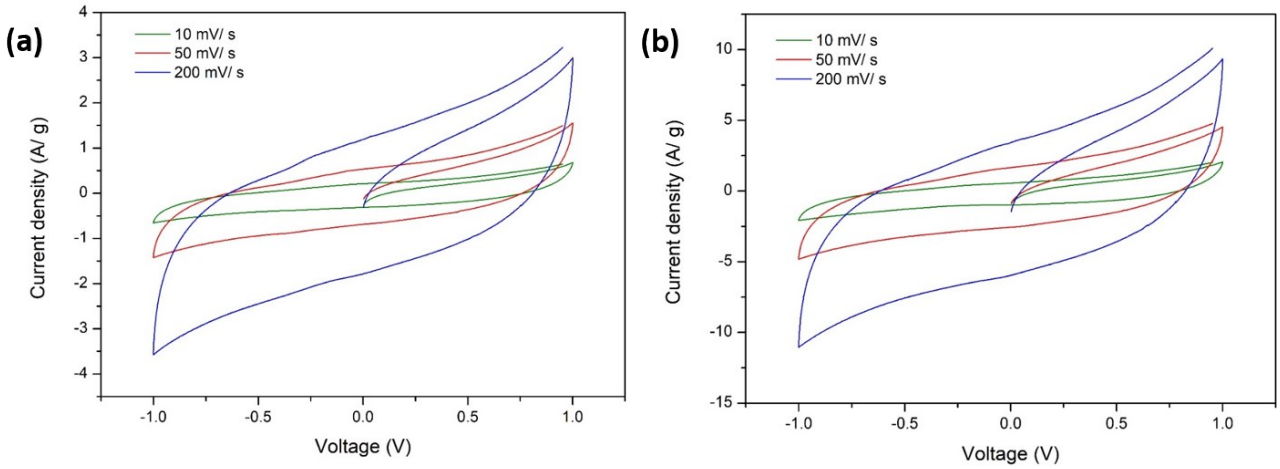


Figure S.9. Cyclic voltammograms of MPAN fibers with 17% (w/w) $MnO_2$ and (a) 0.2% (w/w) and (b) 1% (w/w) rGO at the scan rates 10, 50 and 200 mV/s

**Figure S.10**

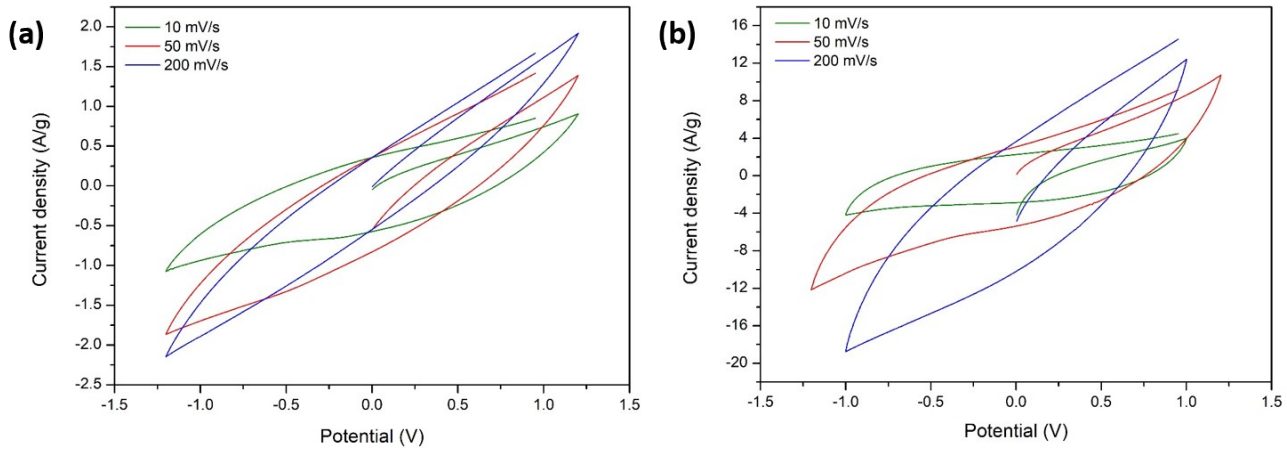


Figure S.10. Cyclic voltammograms of (a) CMnPAN and (b) C-rGOMNPAN fiber electrodes at the scan rates 10, 50, and 200 mV/s